Lectro CPR® Operator's Manual

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IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions for the Lectro CPR® Uninterruptible Power Supply (UPS). These instructions should be followed during installation and maintenance of the power supply, batteries, cabinet, status monitor and any options and/or ancillary equipment.

CAUTION: *RISK OF ELECTRIC SHOCK*. Hazardous electrical live parts inside the power supply are energized from the batteries even when the input AC power is disconnected.

CAUTION: An agency-approved service disconnect switch is required at installation and shall be connected between the utility power source and the CPR power supply. The service disconnect and service disconnect installation is subject to local electrical codes and should be approved for application in a NEMA 3R enclosure, rated 120/240V, with a non-interrupted neutral termination.

For 120 VAC 60 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 20 amperes in the line lead only.

For 240 VAC units, the service disconnect shall be a 2 pole, high-magnetic type circuit breaker rated for 20 amperes.

For 220 VAC 60Hz and 230 VAC 50 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 16 amperes in the line lead only.

CAUTION:

For 120 VAC 60 Hz units, use #12 AWG (minimum) copper, 75°C, for all utility input wiring.

For 240 VAC 60 Hz units, use #12 AWG (minimum) copper, 75°C, for all utility input wiring.

For 230 VAC 50 Hz units, use a minimum of 1.5 mm^2 (#16 AWG copper, 75°C, for all mains input wiring).

CAUTION: The Lectro CPR UPS is a 48Vdc system designed for use with either a single or dual string of four 12Vdc batteries. Please refer to Section 3 of this manual for more details on proper battery installation, maintenance, storage, and replacement procedures

CAUTION: Over current protection and disconnecting means for the AC output are to be supplied by the electrical installer as required by local electrical codes.

CAUTION: The operating temperature range for the Lectro CPR® UPS is –40°C to +55°C for air at the intake of the CPR module.

CAUTION: CPR UPS installations involving third-party cabinets, not supplied by Lectro, require adequate ventilation, airflow and spacing to insure that the CPR® power supply operates within a temperature range of -40°C to +55°C. Failure to provide an operating thermal environment per published specifications will void the warranty.

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EC DECLARATION OF CONFORMITY
Units that are labeled with a CE mark comply with the following EU directives:
73/23/EEC Council Directive on equipment designed for use within certain voltage limits.
93/68/EEC Amending Directive 72/23/EEC.
89/336/EEC Council Directive relating to electromagnetic compatibility.

The EC Declaration of conformity is available upon request for products with a CE mark. For copies of the EC Declaration of Conformity, contact:

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1: Cabinet Installation

1.1 Pole Mounting

NOTE: *Pole mounting the cabinet should be done in accordance with the local agreement between the cable operator and the utility company.*

NOTE: *A bucket truck and other suitable equipment, such as spikes and safety harness, should be used during installation or service of pole-mounted cabinets. To mount the Lectro CPR® UPS to a utility pole perform the following steps:*

1.1.1 Install an appropriate disconnect box between the AC power source and the CPR cabinet mounting point. Wire to power line in accordance with local codes.

NOTE: *The disconnect box should have a* **high magnetic** *type circuit breaker, capable of passing short duration inrush currents, and have a minimum rating as shown below.*

For 120 VAC 60 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 20 amperes in the line lead only.
For 240 VAC units, the service disconnect shall be a 2 pole, high-magnetic type circuit breaker rated for 20 amperes.
For 220VAC 60Hz and 230 VAC 50 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 16 amperes in the line lead only.

1.1.2 Remove the U-shaped bracket from the cabinet rear panel (refer to Figure 1.1-1).

1.1.3 Use the bracket as a template to mark mounting holes at the desired mounting location. If possible, position the cabinet so that the front panel and the external LED's are easily visible.

NOTE: If attaching to a concrete pole additional mounting hardware will be required for the installation. Lectro does not provide the metal bands required to mount to a concrete pole. This hardware can be obtained from a CATV hardware supplier.

1.1.4 Drill 11/16" (17.5mm) holes in the pole at the marked locations.

1.1.5 Attach the bracket to the pole using 5/8" (M16-2.0) hardware (not provided). Make sure that the head of the bolt is next to the pole bracket and the nut is at the rear of the pole. Tighten securely.

1.1.6 Raise the cabinet and set into place on the bracket already attached to the pole. The slots on the pole bracket should be pointing downward so that the cabinet will slide onto the bolts on the pole-mounting bracket. Attach the cabinet using the hardware provided. Tighten ALL the bolts securely.

1.1.7 Confirm the availability of a suitable ground rod at the base of the pole. If required, drive a ground rod according to local codes.

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1.1.8 Refer to Section 1.3 for Electrical Connections.

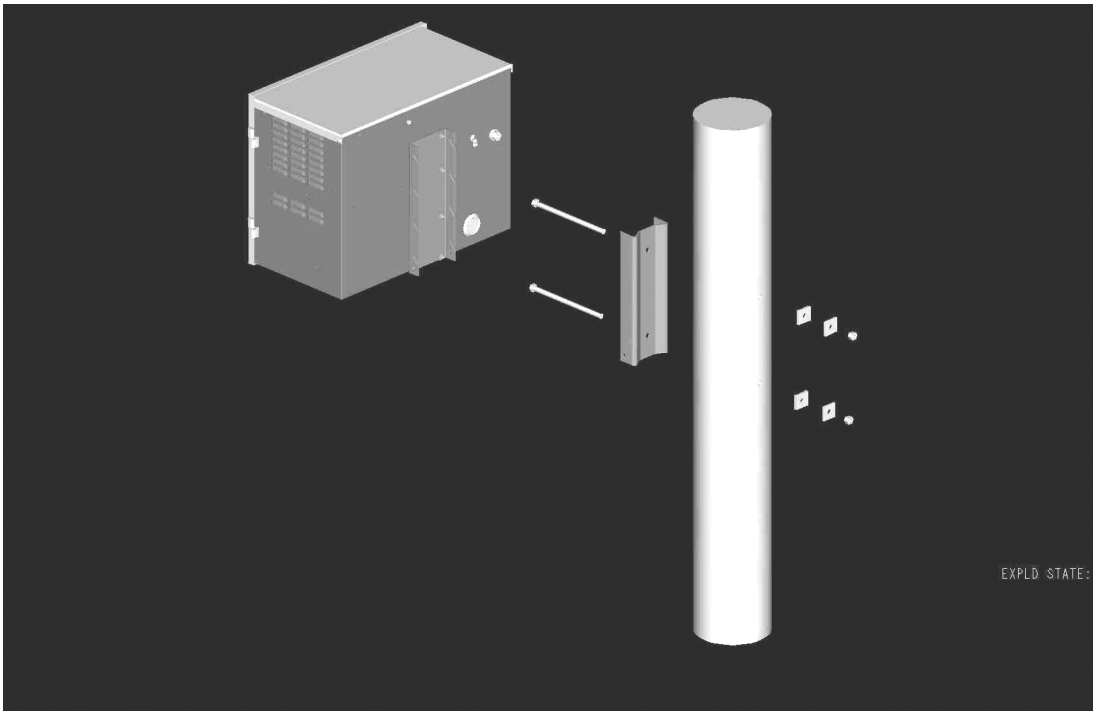

Figure 1.1-1: Pole Mount Installation

1.2 Ground Mounting

Although ground mounting the CPR cabinet can be accomplished by several methods, the following procedure is recommended:

1.2.1 Select an appropriate site. Check with other local utilities for buried plant before site location is finalized. Remove the turf and level an area of approximately 4" greater than the foot print of the CPR cabinet. Refer to Figure 1.2-1 for details.

1.2.2 In accordance with local codes, install the disconnect box near the AC power source.

NOTE: *The disconnect box should have a* **high magnetic** *type circuit breaker, capable of passing short duration inrush currents, and have a minimum rating as shown below.*

For 120 VAC 60 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 20 amperes in the line lead only.
For 240 VAC units, the service disconnect shall be a 2 pole, high-magnetic type circuit breaker rated for 20 amperes.
For 220VAC, 60Hz and 230 VAC 50 Hz units, the service disconnect shall be a high-magnetic type circuit breaker rated for 16 amperes in the line lead only.

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1.2.3 From the disconnect box, install conduit to the power supply site and turn a stub up to extend above grade level. Drive a suitable ground rod according to local codes (refer to Figure 1.2-1).

1.2.4 Install appropriate size conduit for the output connections and turn a stub up to extend 1" above the pad surface cast into the concrete. Make sure to match conduit locations with the appropriate cabinet locations; these locations are indicated in Figure 1.2-1.

1.2.5 Using appropriately sized lumber, construct a form for the cement pad (refer to Figure 1.2-1 for dimensions). Anchor the form securely to the ground. If a pre-formed pad is utilized for the mounting of the CPR cabinet, check the bolt patterns for proper alignment before anchoring the pad to the ground.

1.2.6 Attach the ground mounting brackets from the supplied hardware to the ground skirt using the 5/16-18 X .75 screws and 5/16-18 nuts. Tighten securely.

1.2.7 Make a template from sheet metal or wood indicating the position of the ground-mounting bracket mounting holes.

1.2.8 Drill out the two holes in the template and insert two 5/8" X 4" (M16-2.0 x 100mm) bolts (not supplied). The heads of the bolts will be embedded into the concrete pad when installation is complete. Leave sufficient thread above the pad for securing the ground skirt.

1.2.9 Center the template (with holes in position) over the form. Be sure the conduit stub-ups for the AC input, ground rod, and AC output are positioned at the desired locations just outside the ground skirt. Optional: The conduit stub-ups may pass through the cement pad as shown in Figure 1.2-1 below.

1.2.10 Pour, level, and finish concrete to the bottom of the template. Allow a curing time of 24 hours.

1.2.11 Attach ground skirt to power supply cabinet. Align skirt inside bottom lip of the cabinet and secure using 10-32 X 3/8" screws from the parts kit

1.2.12 Attach the power supply cabinet to the concrete pad using 5/8" (M16-2.0) nuts (not provided) through the ground mounting brackets. Tighten all hardware securely.

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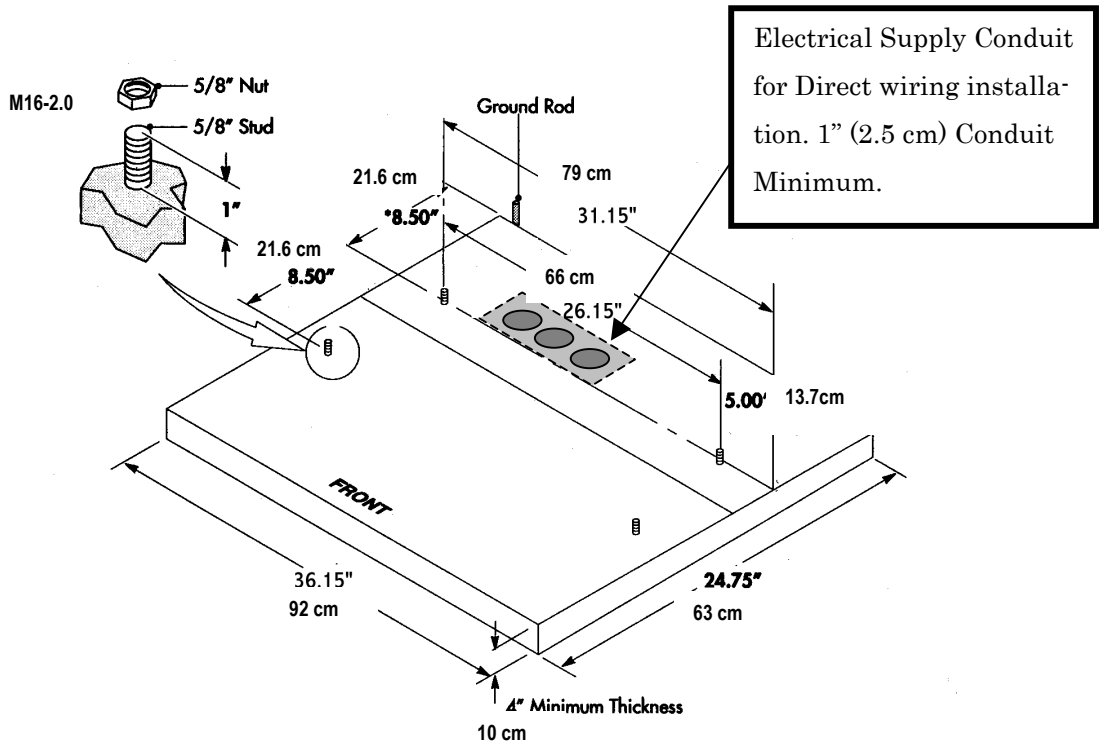

Figure 1.2-1: Ground Mount Profile (Concrete or Concrete composite pad)

Figure 1.2-2: Ground Mount (Front View of 4 battery cabinet with ground skirt)

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Figure 1.2-3: Pole Mount (Front View of 8 battery cabinet)

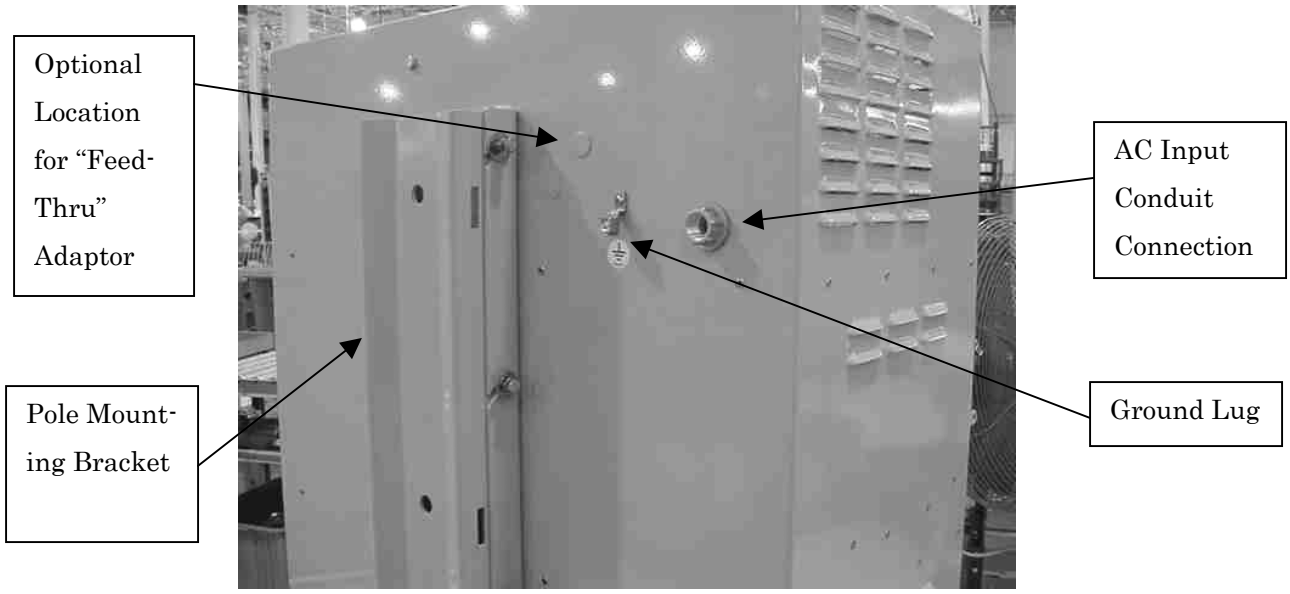

Figure 1.2-4: Pole Mount (Rear View of cabinet)

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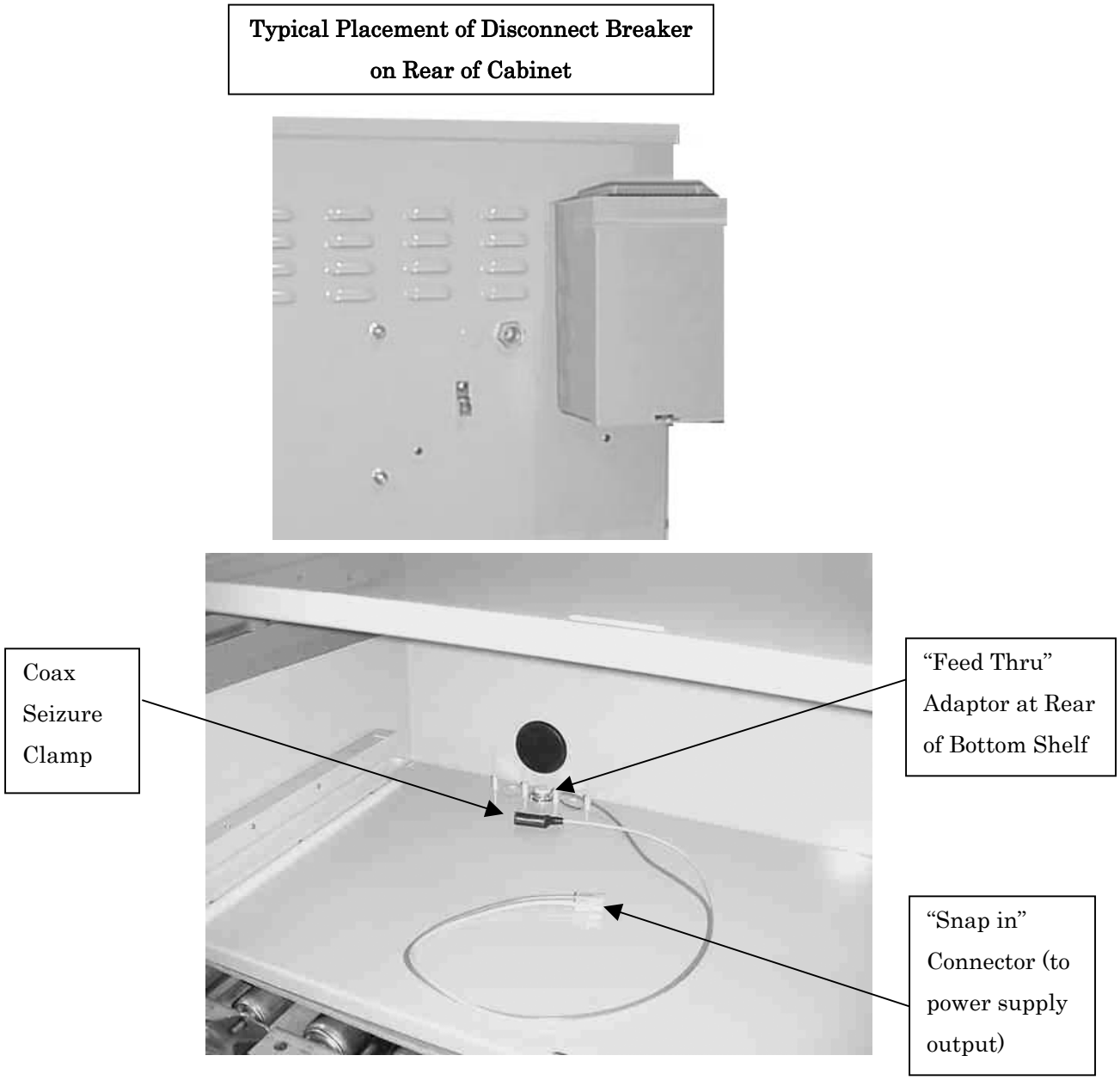
Typical Placement of Disconnect Breaker on Rear of Cabinet
Coax Seizure Clamp
"Feed Thru" Adaptor at Rear of Bottom Shelf
"Snap in" Connector (to power supply output)

Figure 1.2-5: Coax "Feed Thru" Adapter Normal Location (Bottom Shelf)

1.3 Electrical Connections

WARNING: *Be sure the utility (mains) disconnect is off and that no conductors are energized before proceeding.*

To connect wiring, perform the following steps:

1.3.1 Open the cabinet doors.

1.3.2 Install liquid tight conduit to the fitting on the cabinet rear panel and pull the AC primary into the cabinet housing.

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1.3.3 Using the receptacle (if provided), connect the AC high input (black) to the copper receptacle terminal, the AC neutral (white)to the silver receptacle terminal, and the utility protective ground (green) to the green receptacle terminal. The screw tighten torque is 20 lb-in.

1.3.4 Position all wiring neatly in the receptacle box and install the receptacle and then the receptacle cover. NOTE: *Some cabinets do not have receptacles. In this case, the appropriate receptacle must be supplied by the installer.*

1.3.5 Using the output wire harness (green and yellow wires with "snap-in" connectors, a seizure clamp, and O-ring) and cable "feed through" adapter from the parts kit, install the cable adapter and ground wire. Insert the cable adapter from outside the cabinet into the paint-masked hole. The adapter may be mounted on the back of the cabinet, (Figure 1.2-4), or in one of the holes in the bottom battery shelf (*typical for ground mounting, see Figure 1.2-5*). Use the lock nut to secure the adapter and the large O-ring to the cabinet. Tighten securely. Repeat this procedure for units with dual outputs (24 amp model).

1.3.6 Install your choice of coax cable in the adapter. A 90° adapter may be required for some installations. Connect the yellow output wire to the center pin of the cable by sliding the seizure clamp into place and tightening securely. Cut the center pin of the cable to allow about 1/4" of the pin to extend beyond the end of the clamp. Slide the protective boot over the connector center pin and seizure clamp.

1.3.7 Connect an unbroken 6 AWG soft-drawn copper ground wire between the ground lug provided on the back of the cabinet and the ground rod for transient voltage protection. Note: Keep the ground wire as straight as possible. Use a ground rod clamp of the proper type, above or below grade.

1.3.8 Proceed with the CPR Power Module installation as described in Section 2.

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2 : Power Supply

2.1 Installation

Refer to Section 1 for installation of the pole mount or ground mount enclosure.

NOTE: *The CPR module weighs 56 lbs/25 kg. (65 lbs./30 kg for the 24 amp model), and the center of gravity is offset to the right. The unit may be lifted using both of the lifting handles on the front of the module.*
CAUTION: When pulling the unit forward from a shelf, be sure to support the right hand rear corner.

Figure 2.1-1: CPR Cabinet-Completely Wired

2.1.1 Verify the battery breaker on the front panel of the CPR is open.
2.1.2 Connect the green and yellow output harness on the CPR UPS to the mating connector on the harness that is installed in the cabinet. Verify the wire colors and connector
colors match.

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2.1.3 Connect the green ground wire from the CPR UPS to the back of the mounting bolt that holds the exterior ground clamp to the wall of the enclosure. Use the #10 hardware provided.

2.1.4 For those power supplies with IEC power cords, plug the cord into the receptacle on the left side of the power supply. Use only an HAR-approved power cord for 50 Hz installations. Tighten the screw on the clamp until the power cord is secure.

2.1.5 If the batteries are not installed, install them at this time per the instructions in Section 3. Connect the **battery sensing wire harness** to the appropriate battery terminals as shown in Figure 2.1-3. Use appropriate flat washers when connecting this harness to small battery terminals. Plug the connector from the **battery sensing harness** into the mating connector on the **CPR Communicator Module** at the front of the power supply module.

2.1.6 Locate the wire harness that connects to the LEDs on the exterior of the CPR outdoor enclosure. Plug this harness into the mating connector on the **CPR Communicator Module** at the front of the power supply module.

2.1.7 If a **Tamper Switch** is installed in the cabinet, plug it's wire harness into the mating connector on the **CPR Communicator Module** at the front of the power supply module.

2.1.8 If the optional **Battery Temperature Probe** is used, connect the sensor plate containing the small PC board to the most negative battery terminal (the same terminal where the negative [black] wire from the CPR module is connected, see Figure 2.1-3). Plug in the modular phone type connector into the RJ-11 port on the left side of the CPR module.

2.1.9 Confirm that the battery breaker on the front of the CPR module is open. Connect the ring lugs at the other end of this harness to the positive and negative terminals of the battery as described in Section 3. Use appropriate flat washers when connecting this harness to smaller battery terminals. Plug the large gray battery power plug into the receptacle on the left side of the CPR module.

2.1.10 Select the appropriate output voltage for the network that this UPS is powering. This is accomplished by plugging in the short yellow wire(s) on the left side of the CPR module into the receptacle labeled "48 V," "60 V," 75 V," or "87 V." This setting determines the voltage that will be present at the green and yellow connector on the output harness (or the coaxial fitting) when the CPR unit is operating.

CAUTION: If the unit is set for 75 or 87 VAC, make SURE that the network components (actives and passives) are rated to handle these higher voltages before energizing the CPR power supply.

2.1.11 Confirm that the external AC disconnect is OFF.

2.1.12 Plug the AC input cord into the receptacle at the left rear of the outdoor enclosure.

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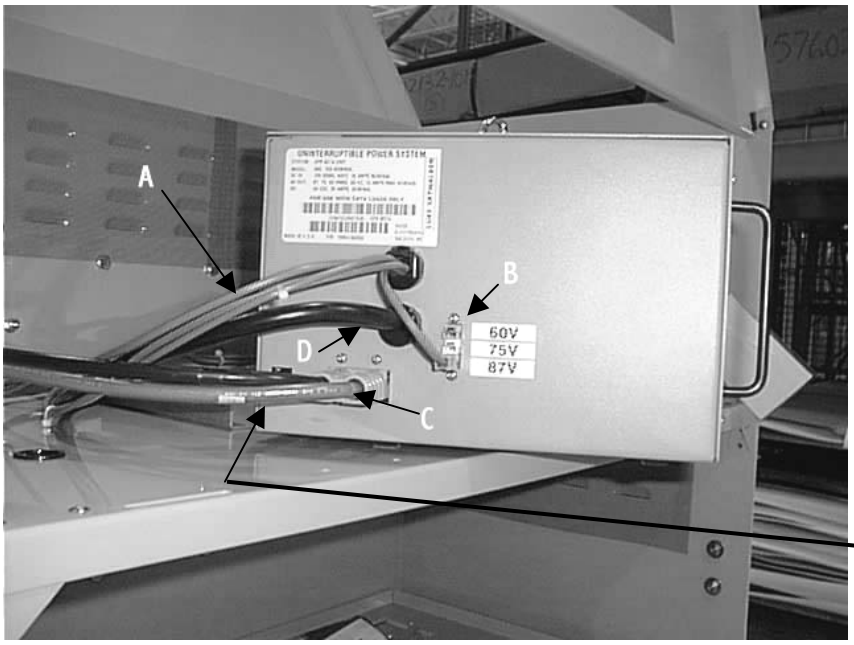
THE CPR SYSTEM IS NOW READY TO BE ENERGIZED. FOLLOW THE OPERATING PROCEDURE IN SECTION 2.2.



60 Hz Units (15 amp)

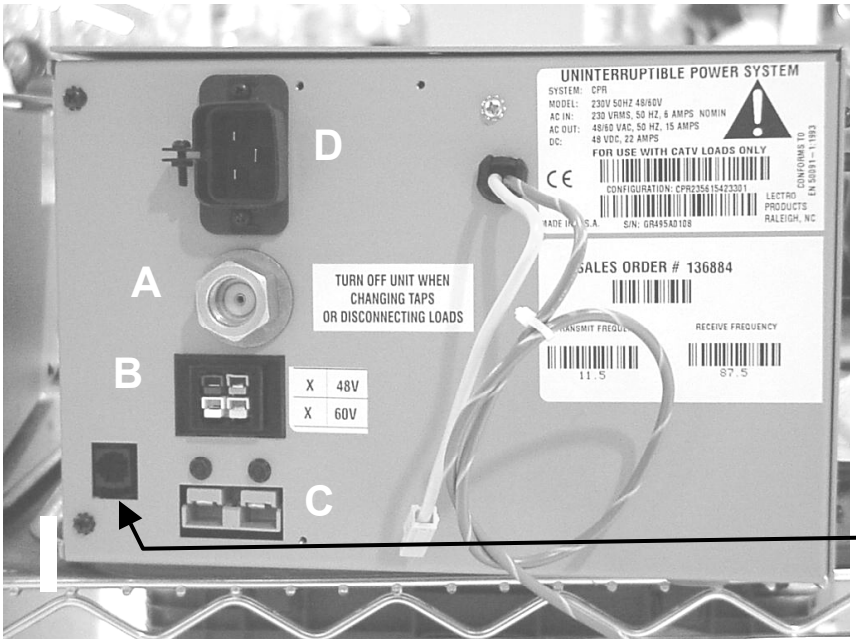
A AC Output Cable

B Output Voltage Select

C Battery Power Cable

D AC Input

Fig. 2.1-2 Input/Output Voltage, Temp. Probe Connection points



50 Hz Units

A AC Output Fitting

(Green and Yellow cable may be used for output connection)

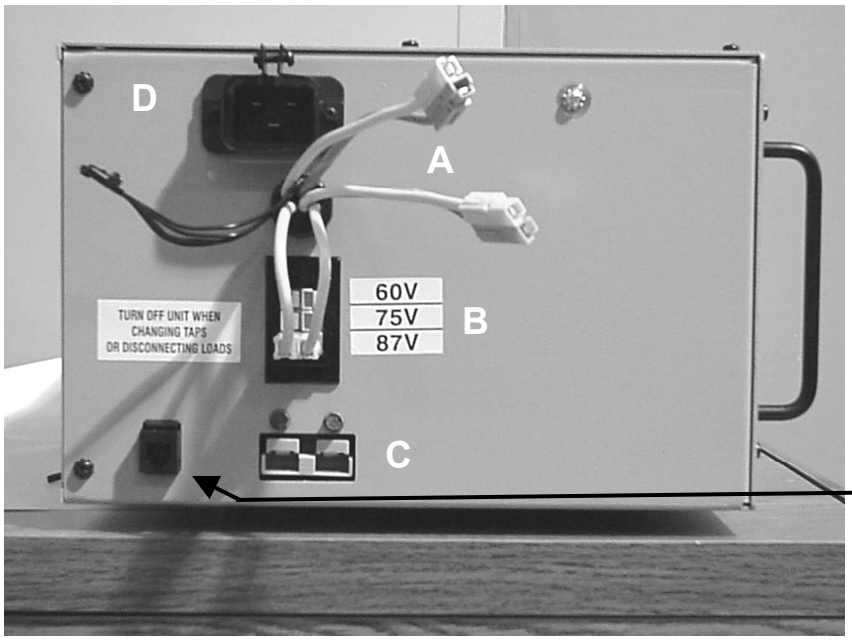
B Output Voltage Select

C Battery Power Cable

D AC Input

Fig. 2.1-3 Input/Output Voltage, Temp. Probe Connection points

Preliminary



60 Hz Units (24 amp)

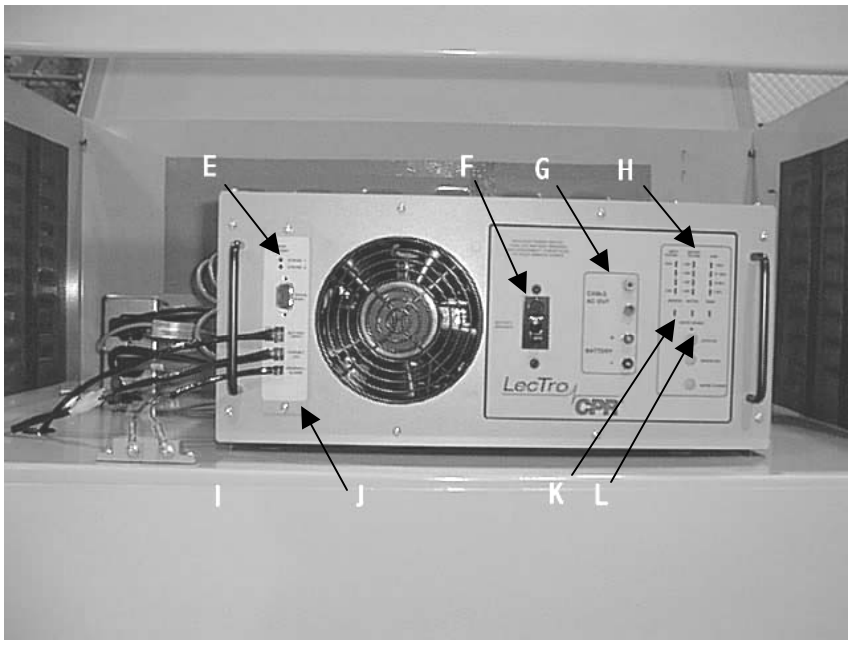
A AC Output Cables (2)

B Output Voltage Select

C Battery Power Cable

D AC Input

Fig. 2.1-4 Input/Output Voltage, Temp. Probe Connection points



Front Panel (All Units)

E Weak Battery LEDs

F Battery Breaker

G Test Points

H LED Display

J CPR Communicator Module

K Inverter "ON" LED

L Output "ON" LED

Figure 2.1-5 CPR Module Front and Side Views

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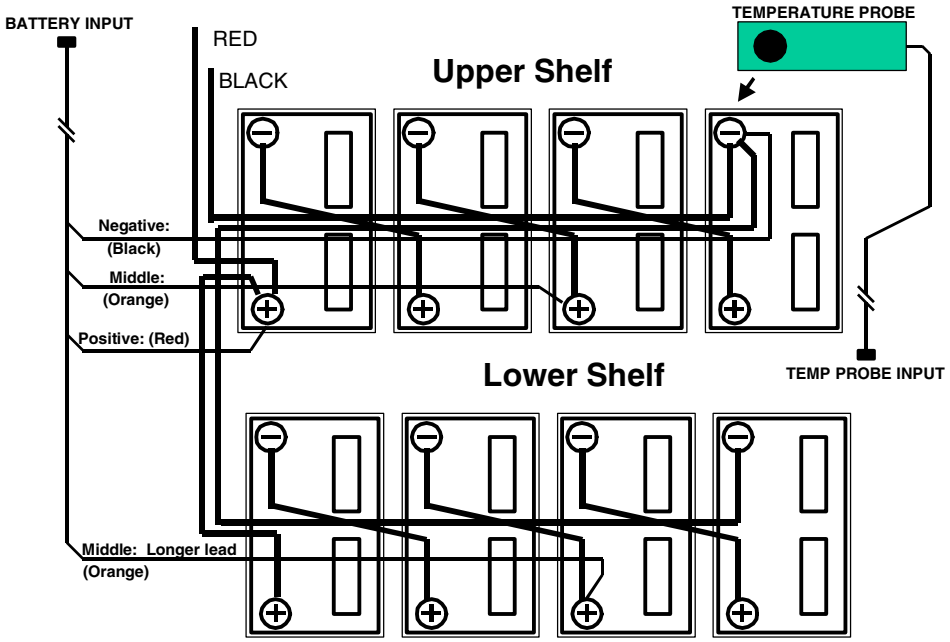

Figure 2.1-6: Battery Sensing and Temperature Probe Connection – Parallel Strings

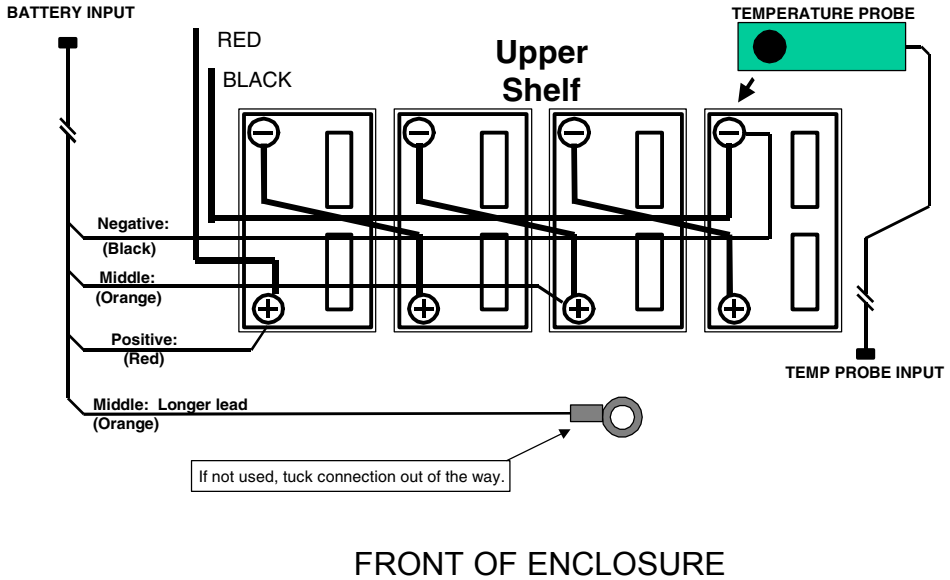

Figure 2.1-7: Battery Sensing and Temperature Probe Connection – Single String

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2.2 Operation

CPR UPS STARTUP AND INVERTER TEST

2.2.1 Verify that all connections to the CPR have been made correctly as described in Section 2.1.

2.2.2 Verify that the desired output voltage has been selected (48V, 60V, 75V, or 87V) via the connection at the left side of the CPR module. Check to see that the AC input cord and Battery power cables are plugged in.

2.2.3 Turn on the external disconnect breaker (supplied by the installer), then close the battery breaker on the front of the CPR module. There should be only green LEDs lit on the display. If red LEDs are illuminated, see Section 2.4, Trouble-shooting.

2.2.4 Verify that the "Output Voltage" green LED is lit on the front display. The CPR System should now be providing power to your network. Verify with a voltmeter at the point where the coax exits the cabinet.

2.2.5 The front panel display includes "bar graph" indicators to describe input voltage levels, battery voltage levels, and output load levels. See **Figure 2.2-1** for more information.

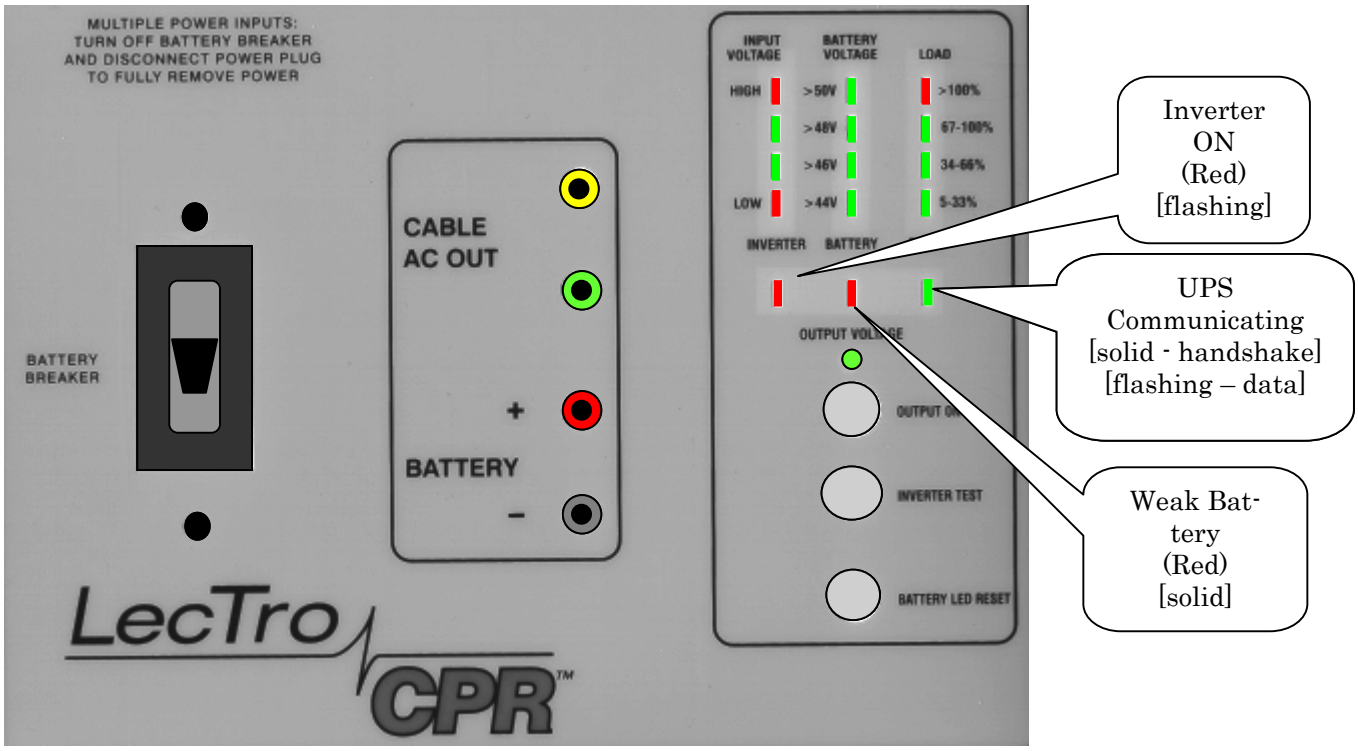

Figure 2.2-1: Front Panel Display

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2.2.6 Check the front panel test points with a true RMS voltmeter.

CABLE AC OUT should read within 3-5% (maximum range is tap dependent) of the configured output voltage (48, 60, 75, or 87 V). **BATTERY** should read between 45 and 56 Vdc, depending on the age, temperature, and state-of charge of the batteries.

2.2.7 Verify that the external LEDs on the CPR outdoor cabinet are functioning. In normal operation, the green external LED will be ON solid, (not flashing). The green LED flashes when the CPR system is on battery, and the red LED flashes when there is a system alarm or failure.

2.2.8 INVERTER TEST: This test will verify proper operation of the system inverter. Push the front panel button labeled "Inverter Test." The red "inverter" LED should flash on the front panel, and the fan will run. Check the CABLE AC OUT test points for proper voltage. The inverter test lasts from 1.0 to 2.0 minutes, and will automatically return to normal mode at the conclusion of the test. If the inverter fails to start, check for an open battery breaker or a loose battery terminal connection.

2.2.9 Once the unit has returned to normal operation, after the inverter test, the system startup is complete.

NOTE: *The CPR UPS can also be "hot started" on battery power when utility power is not present. To hot start the CPR, close the battery breaker on the front panel, and press and hold the "output on" button. The inverter will start within 3 seconds. The unit will operate until the battery capacity is depleted.*

CPR SHUTDOWN PROCEDURE

To shut down the CPR power supply, open the battery breaker, and unplug the AC power cord.

WARNING*: RISK OF ELECTRIC SHOCK. Hazardous electrical live parts inside the power supply are energized from the batteries even when the input AC power is disconnected.*

2.3 Maintenance

Note: *It is important that secure mechanical and electrical connections be maintained on this equipment. Secure connections will help prevent outages and equipment damage. Refer to Figure 2.3-1 for a sample of a maintenance log sheet.*

2.3.1 Inspect the external ground connections for mechanical integrity and good physical condition. Check the cabinet for damage and check the mounting hardware for mechanical integrity.

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2.3.2 Open the cabinet. Check tightness of all battery, internal ground, and output connections. Observe condition of batteries. If the cabinet shows signs of excessive dust or moisture, check for lost vent screens. Repair as required, and note any unusual conditions for future reference.

2.3.3 Inspect the input surge suppressor (if installed) for obvious damage. If it appears intact, check its operation with a megger or a similar device to ensure that it is functioning. Note that a failed surge suppressor may appear visually to be OK, yet allow damaging transients and surges to enter the power supply, and possibly the coax network. *It is very important to test the surge suppressor with a megger to make sure it is actually protecting the power supply.*

2.3.4 On the maintenance log sheet (Figure 2.3-1), mark which LEDs are illuminated on the front panel of the CPR UPS. The presence of any red LED indicates an alarm or failure which will require immediate attention. See Section 2.4 for troubleshooting information.

2.3.5 The CPR system will automatically and periodically load test the batteries. If a failing battery is detected, the battery LED (red) on the front panel will illuminate. If the battery LED is illuminated, replace the affected battery (or string of batteries) and press the "battery LED reset" button on the front panel. See Section 3.2 for more details on how the CPR senses a weak battery, and the proper procedures for replacement.

2.3.6 Use a true RMS meter to record AC output voltage and battery voltage at the front panel test points. If available, use a clamp-on current probe to record AC output current at the cable adapter.

2.3.7 Turn the battery circuit breaker off (down). Record the voltage for each battery (well matched batteries should differ by no more than 0.2 Vdc). If the battery has a date code on the label, record it on the maintenance log sheet.

2.3.8 Using a battery load tester, check the performance of each battery. Note that the CPR UPS performs battery load testing automatically, so this step may be omitted if desired.

2.3.9 Close the battery circuit breaker on the front panel.

2.3.10 Force the unit into standby operation by pressing the "inverter test" button on the front panel. Verify that the red inverter LED illuminates and that the output voltage remains within +/- 3-5% of the nominal voltage (48, 60, 75 or 87 VAC). Verify the unit returns automatically to normal operation after 1 to 2 minutes.

2.3.11 Confirm that only GREEN LEDs are illuminated, remove all tools and meters, and close and lock the cabinet. This completes routine maintenance of the CPR power supply.

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Lectro CPR Power Supply Maintenance Log Sheet

For use with the maintenance procedures in the Operator's Manual.

Cable Company:_____

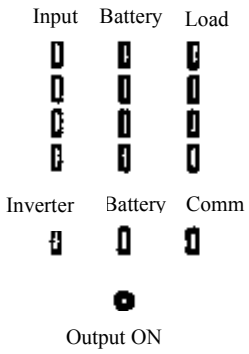
Inspection Date:_____ Location:_____

Technician:_____ Model/Serial#:_____

Visual Inspection — Problem and Fix:_____ Comments:_____

Battery Weak LEDs: **String1: ON / OFF** **String 2: ON / OFF**

LED Display: Mark the illuminated LEDs on the diagram below:



DVM (RMS Voltmeter) Readings

Cable Output Voltage:_____ (Test Points) Battery Voltage:_____ (Test Points) AC Amps:_____ (Clamp on Probe)

Press "Inverter Test" button.

Standby AC voltage:_____ Fan Running? **Y** **N**

Remove Dust and Moisture from Cabinet:_____OK

Comments:_____

_____

_____

_____

Figure 2.3-1: Maintenance Log Sheet

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2.4 Troubleshooting

Table 2.4-1: Troubleshooting guide

Symptom	Possible Cause	What To Do
No AC output to coax cable	Utility failure	Notify local Power Co..
	External input breaker open or tripped	Re-close breaker. Verify breaker is HIGH MAGNETIC type.
	AC power cord loose/unplugged	Re-insert plug into receptacle.
	Utility voltage or frequency (or generator output) is out of range. AC input to power supply must be within the following limits: **Voltage:** 96V to 156 V (or 192V-276V for 240V nominal units, or 161V-299V for 230V nominal units, or154V-286V for 220V nominal units) RMS **Frequency:** 57 to 63 Hz	Measure the AC source voltage and frequency. If out of limits, notify Power Co. or, if a generator is used, either adjust its output, or select a larger generator.
	AC output harness is disconnected or loose	Verify all connections from the AC output (green and yellow) connector to the coax fitting.
Inverter does not run, or module does not transfer to "standby" either during a power failure or an "inverter test"	Inverter failure	If the "Battery" LED is "off" on the front panel, then the inverter may have failed, and the CPR module should be replaced.
	Battery breaker open	Close battery breaker on front panel.
	Battery too weak to support inverter. Front panel "battery" LED should be illuminated.	Test Batteries with a load tester. Replace any that fail the test.
CPR module fails to transfer from "standby" back to "normal" mode after a utility outage	Utility (or generator) out of limits on voltage or frequency. See "No AC output" above.	Measure the AC source voltage and frequency. If out of limits, notify Power Co. or, if a generator is used, either adjust its output, or select a larger generator.
	External input breaker open or tripped	Re-close breaker. Verify breaker is HIGH MAGNETIC type.
	Input Relay Failure	Replace CPR module.

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AC Input "High" red LED is lit	AC input voltage is above 156 (or 299 for 230V nominal units, or 276 for 240V nominal units, or 286V for 220V nominal units) VAC—unit will be in Standby mode, running on battery	Measure AC input voltage with a true RMS voltmeter. If above 156V (or 265, or 276), notify local Power Company of the significant overvoltage at the power supply location. Operate the CPR from an alternate AC source (generator) until the overvoltage is corrected.
AC Input "Low" red LED is lit.	AC input voltage is below 96 (or 161 for 230v nominal units, or 192 for 240V nominal units, or 154V for 220V nominal units)VAC—unit will be in Standby mode, running on battery	Measure AC input voltage with a true RMS voltmeter. If below 96V (or 184, or192V), notify local Power Company of the significant undervoltage at the power supply location. Operate the CPR from an alternate AC source (generator) until the undervoltage is corrected.
Load ">100%" red LED is lit.	CPR unit is loaded >100%. If the overload is >110% The output will turn off after 30 seconds, and then attempt to restart every 30 seconds for 3 hours. If the overload is not removed after 3 hours, the module will shut down and must be manually reset by pressing the "Output ON" button.	Reduce the overload in the coax network.
"Inverter" red LED is lit	Inverter is operating. This is normal if Utility power has failed.	Measure AC input voltage with a true RMS voltmeter. If power is present, verify Utility voltage and frequency is within the limits shown above in this table.
Output voltage reads zero or nearly zero at the front panel test points	Coax network is shorted Output has been disabled due to overload timeout.	Measure AC output current with a clamp-on probe. If it is > rated output amps, check the network for a short circuit, or "bucking power" and correct. Press "output ON" button. The "Output Voltage" LED should come on. Check network for overloads.

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2.5 Specifications

Table 2.5-1: Specifications

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Unit Name	120V Extd Range	220V International	230V International	230V Euro (CE)	240V (24 A)
Nominal Input Voltage	120V	220V	230V	230V	240V
Input Voltage Range in %	[+30% to -20%]	[+30% to -30%]	[+30% to -30%]	[+15% to -20%]	[+15% to -20%]
Input Voltage Range	96V to 156V	154V to 286V	161V to 299V	184V to 265V	192V to 276V
Nominal Input Current (Rest Mode)	13A	7A	7A	8A	11A
Input Frequency	60 Hz, +/- 3Hz	60 Hz, +/- 3Hz	50 Hz, +/- 3Hz	50 Hz, +/- 3Hz	60 Hz, +/- 3Hz
Output Voltage	87/75/60 Vrms (Field Selectable)	87/75/60 Vrms (Field Selectable)	87/75/60 Vrms (Field Selectable)	60/48 Vrms (Field Selectable)	87/75/60 Vrms (Field Selectable)
Output Regulation 87 Volt Tap	[+/- 3%]	[+/- 3%]	[+/- 3%]	N/A	[+/- 3%]
Output Regulation 75 Volt Tap	[+/- 4%]	[+/- 4%]	[+/- 4%]	N/A	[+/- 4%]
Output Regulation 60 Volt Tap	[+/- 4%]	[+/- 4%]	[+/- 4%]	[+/-3%]	[+/- 4%]
Output Regulation 48 Volt Tap	N/A	N/A	N/A	[+/-3%]	N/A
Rated Output Current	15A	15A	15A	15A	24A
Ouptut Frequency(Inverter Mode)	60Hz, +/- 1Hz	60Hz, +/- 1Hz	50Hz, +/- 1Hz	50Hz, +/- 1Hz	60Hz, +/- 1Hz
Waveform	Quasi Squarewave	Quasi Squarewave	Quasi Squarewave	Quasi Squarewave	Quasi Squarewave
Slew Rate	< 100 Volts/ms	< 100 Volts/ms	< 100 Volts/ms	< 100 Volts/ms	< 100 Volts/ms
Crest Ratio (Peak: RMS)	1.3:1	1.3:1	1.3:1	1.3:1	1.3:1
Efficiency @87Vrms On-Line Rest Mode					
@100 % Load	91%	91%	91%	91%	91%
@80 % Load	90%	91%	91%	90%	91%
@60 % Load	89%	89%	89%	88%	89%
@40 % Load	85%	85%	84%	85%	85%
Efficiency @87Vrms Inverter Mode 48VDC					
@100 % Load	88%	86%	86%	87%	88%
@80 % Load	87%	87%	87%	87%	87%
@60 % Load	86%	86%	86%	87%	86%
@40 % Load	81%	81%	81%	83%	81%
Foldback (Near Short Circuit Current)					
87 Volt Tap	22A	19A	21A	N/A	32A
75 Volt Tap	20A	21A	24A	N/A	29A
60 Volt Tap	19A	27A	27A	21A	36A
(Max Knee Current (Start-Up Power)					
87 Volt Tap % Rated Current	150%	150%	150%	N/A	165%
75 Volt Tap % Rated Current	155%	180%	160%	N/A	192%
60 Volt Tap % Rated Current	180%	210%	180%	150%	234%
>110% (3 hour Cyclic Operation)					
30 Sec. On, 30 Sec Off	>16.5A	>16.5A	>16.5A	>16.5A	N/A
Severe Overload (3 hour Cyclic Operation)					
6 Sec. On, 26 Sec. Off	>21A	>21A	>21 A	>21 A	27.25A
Unit Weight	60 lbs (27kg)	59 lbs (27 kg)	66 lbs (30kg)	55 lbs (25 kg)	69.5 lbs (32 kg)
DC Battery Breaker					
Enviornmental					
Operating Range	-40 degrees C to +55 degrees C at front air inlet of power supply				
Humidity	0 to 95% (non condensing)				
Elevation	0 to 10,000 feet (3000 meters) above sea level				
DC Electrical					
DC Input Voltage	48 VDC				
Constant Current	High rate charge, threshold at 2.35 VPC				
Constant Voltage	2.35 VPC (Maximum 48 hours)				
DC Charge Current	6-12A Maximum, depending on load				
Low Battery Cutoff	<1.75 VPC				

3: Batteries

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3.1 Safety

CAUTION: Short circuit danger: Do not rest tools or equipment on top of batteries. Do not allow batteries to become shorted as an explosion may occur causing severe injury. Do not open or mutilate batteries. Released electrolyte is extremely harmful to skin and eyes. Do not dispose of batteries in fire as an explosion may occur.

CAUTION: Government regulations may require that batteries be recycled. See your battery distributor for details on recycling (third-party batteries) or contact Alpha Technologies for recycling CPR battery products.

CAUTION: Batteries shall be 12 Vdc with the same amp-hour rating. Do not mix old and new batteries; replace batteries as a set using UL recognized batteries.

CAUTION: Servicing of batteries shall be performed or supervised by personnel knowledgeable of batteries and the required precautions. **Keep unauthorized personnel away from batteries**.

CAUTION: The following precautions shall be observed when working with batteries:

Follow approved OSHA (or appropriate other) regulations for handling batteries.
Always wear eye protection and a protective vest when working near batteries.
Batteries produce explosive gases. Keep away all sparks and flames.
Remove watches, rings or other metal objects.
Use tools with insulated handles.
Wear rubber gloves and boots.

3.2 Battery installation

Tools required: 10mm Metric socket
Inch-pound torque wrench
Multimeter

3.2.1 Place the batteries in the bottom of the cabinet, negative terminals (-) at the rear of the cabinet. Refer to Figure 3.3-1 for details.

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3.2.2 Connect the red battery cable which comes from the gray connector on the CPR module to the positive (+) terminal of the left battery. Refer to Figure 3.3-1 for details. Torque all connections to 60 inch-pounds (6.8 Newton-meters).

3.2.3 Connect the three (3) battery interconnection jumpers as shown in Figure 3.3-1. Torque all connections to 60 inch-pounds (6.8 Newton-meters).

3.2.4 Confirm that the CPR DC circuit breaker is off (down). Connect the black battery cable which comes from the gray connector on the CPR module to the negative (-) terminal of the right battery. Torque connection to 60 inch-pounds (6.8 Newton-meters).

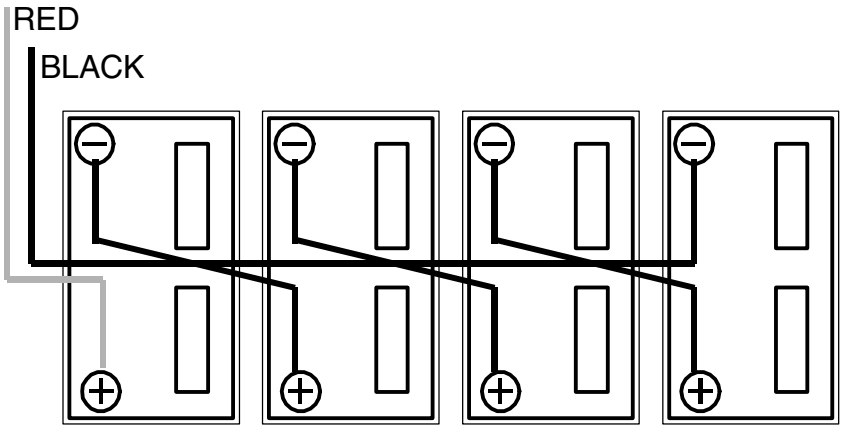
3.2.5 Measure the DC voltage to ensure proper installation of all battery wiring. Open circuit DC voltage should measure between 45 volts and 51 volts.

3.2.6 Verify that the gray Anderson connector is properly attached to the left side of the CPR module.

3.3 Battery Removal

3.3.1 Turn the DC circuit breaker off (down) and observe all precautions for handling batteries as outlined in Section 3.1.

3.3.2 Remove all batteries in the reverse order of installation.



FRONT OF CABINET

Figure 3.3-1: Battery Connections – single string

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3.4 Additional Battery String

Tools required: 10mm Metric socket
Inch-pound torque wrench
Multimeter

NOTE: *This procedure assumes that the additional battery string is being installed in a Lectro brand cabinet.*

3.4.1 Confirm that the CPR DC circuit breaker is off (down).
3.4.2 Place the batteries in the bottom of the cabinet with the negative terminals (-) at the rear of the cabinet. Refer to Figure 3.4-1 for details
3.4.3 Connect the red battery lead from the lower shelf at the positive (+) terminal of the left battery. Torque connection to 60 inch-pounds (6.8 Newton-meters).
3.4.4 Disconnect the red battery lead cable from the upper shelf at the positive (+) terminal of the left battery. Reconnect this lead with the red lead of the inter-shelf connection cable. Refer to Figure 3.4-1. For details.
3.4.5 Connect the three (3) battery interconnection jumpers as shown in Figure 3.4-1. Torque all connections to 60 inch-pounds (6.8 Newton-meters).
3.4.6 Disconnect the black battery lead cable from the upper shelf at the negative (-) terminal of the right battery. Reconnect this lead with the black lead of the inter-shelf connection cable. Refer to Figure 3.4-1 for details. Torque connection to 60 inch-pounds (6.8 Newton-meters).
3.4.7 Measure the DC voltage to ensure proper installation of all battery wiring. Open circuit DC voltage should measure at least 48 volts across both parallel strings.
3.4.8 Verify that the gray Anderson connector is properly attached to the left side of the CPR module.

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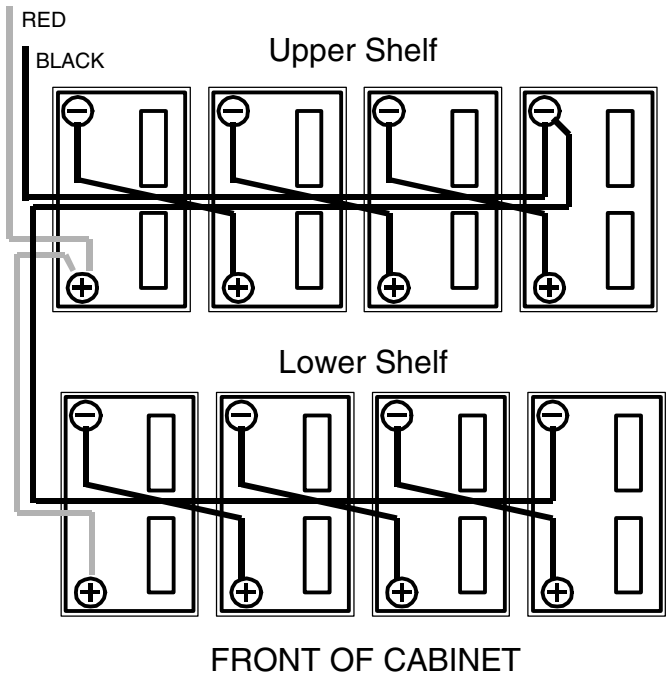

Figure 3.4-1: Battery Connections – Parallel Strings

3.5 Maintenance

3.5.1 WHILE IN STORAGE

Always make sure a battery is fully charged before placing it into storage.
Never charge batteries in a gas-tight container.
Always store batteries in a cool, dry location. Optimum temperature is 25°C (77°F).
Always monitor battery, open-circuit voltage at least once every 12 months.
Always provide a refreshing charge if the open circuit voltage drops below 12.2 volts.

3.5.2 PROPER USEAGE

Always make sure a battery is fully charged prior to placing it into service.
Never mix batteries that are at different states of charge. (Refer to battery date codes)
Make sure that the open circuit voltage for each battery in a string is greater than 12.8 volts.
Never mix battery types or batteries that are at different states of charge.

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A different state of charge condition likely exists if the open circuit voltage for any battery in a string deviates from its neighbor by more than ± 0.25 volts.
Never leave a battery in a discharged state for any length of time.

3.5.3 PERIODIC MAINTENANCE

Never forget to periodically check batteries for proper terminal attachment torque every 12 months.

* * * * * * *

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4: Status Monitor

4.1 Installation

The communication module installs in the same basic manner for all three levels of status monitoring. The external connections will be different as defined in Section 4.3.

4.1.1 Turn off the CPR Unit, and remove AC Power.

4.1.2 Remove the communication module cover plate (if applicable).

4.1.3 Locate and pull out the ribbon cable with the connector, inside of the CPR Communicator module slot.

4.1.4 Plug in the ribbon cable connector into the PC board connector on the CPR Communicator module.

4.1.5 Insert the CPR Communicator module into the open slot on the CPR and secure with the two mounting screws. Use caution when inserting so as not to "pinch" the ribbon cable between the slot and the module. Refer to figure 4.1-1.

Figure 4.1-1: CPR Unit, Showing Communicator Location

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4.2 Operation

The operation of the status monitor is automatic and carries out its functions without the direct intervention of the operator. The purpose of the status monitor is to indicate the operating conditions of the CPR power supply. There are three levels of status monitoring:

LEVEL ONE is used to indicate locally (at the power supply) only (see Figure 4.3-1). This can be a combination of the external cabinet LED indicators and/or the LED's on the CPR power supply. This level is NOT compatible with transponder devices. The information available in addition to the information displayed on the front of the CPR power supply is as follows: A)Weak battery string indicators (located on the Communicator module - refer to Figure 4.3-1); B) Normal operation, Standby operation, and Alarm condition indicators (with the external cabinet LED's). The weak battery indicators can be reset by pushing the Battery LED Reset button, located on the front of the CPR power supply. Refer to Figure 4.1-1

LEVEL TWO allows for remote status monitoring with access to additional, more detailed information (see Figure 4.3-2). Level Two is essentially the same as Level One with the addition of a DB-9 connector located on the front of the communication module. The DB-9 connector is used to indicate remotely via a third party transponder device. The data available is in RS-232 format. Additionally, information can be obtained through the DB-9 connector with the use of a PC using a software program called *FailSafe*, available from Alpha Technologies. A customer-supplied PDA device may also be connected to this port using application and instructions available from Alpha Technologies. A telephony modem may also be connected to the RS-232 port. Be sure to disable "hardware handshaking" for proper operation of the modem in this application.

LEVEL THREE allows for remote status monitoring similar to Level One and Two with the DB-9 connector replaced by an F-81 style, 75-ohm, RF connector (see Figure 4.3-3)*. Level Three is used to indicate remotely via an internal (inside the communicator module) RF transponder. The F-81 connector is used to make the connection between the transponder and the CATV Network.

*Contact Alpha Technologies for information on compatibility with other popular status monitoring systems.

Note: *All three levels have the ability to provide local indications. Each level uses a different communication module, mounted on the left side of the CPR module (see Figure 4.1-1).*

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4.3 Configuration

Level One – Refer to Figure 4.3-1
Level Two – Refer to Figure 4.3-2
Level Three – Refer to Figure 4.3-3

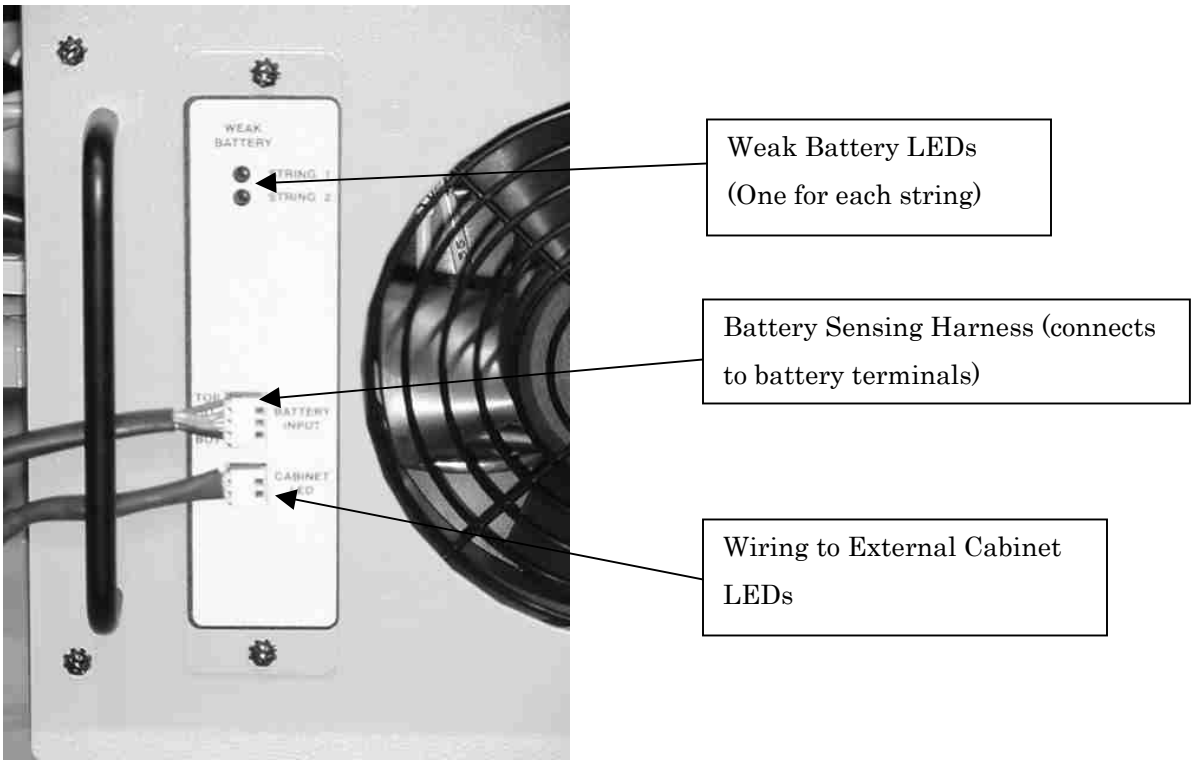
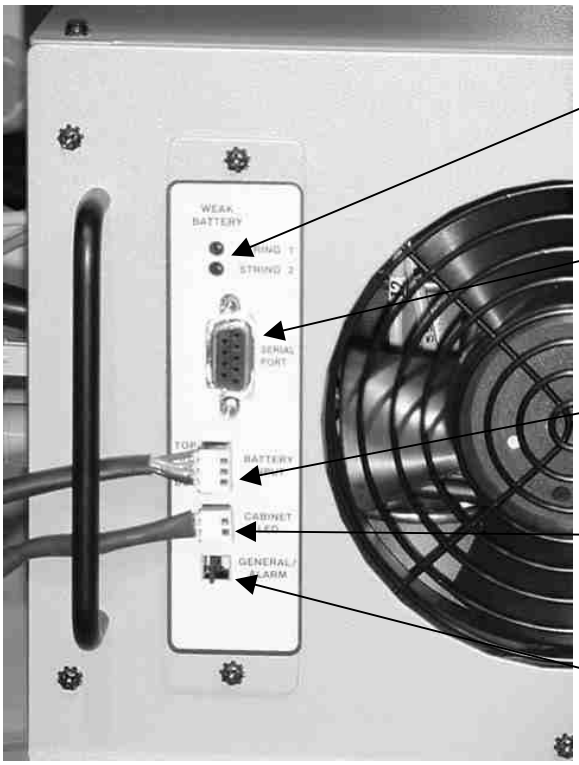

WEAK BATTERY
Weak Battery LEDs (One for each string)
Battery Sensing Harness (connects to battery terminals)
Wiring to External Cabinet LEDs

Figure 4.3-1: Front of CPR Communicator Module (Level One)

Preliminary



Weak Battery LEDs (One for each string)

RS-232 DB-9 Port for connection to Transponder, Modem, Laptop PC or customer-supplied PDA.

Battery Sensing Harness (connects to battery terminals)

Wiring to External Cabinet LEDs

Door Tamper Switch connector (shown with shorting jumper)

Figure 4.3-2: Front of CPR Communicator Module (Level Two)

Battery Sensing Harness (connects to battery terminals)

Wiring to External Cabinet LEDs

Door Tamper Switch connector (shown with shorting jumper)

F81 Connector for RF Output Direct to Coax

Transmit and Receive Frequency Label

Figure 4.3-3: Front of CPR Communicator Module (Level Three)

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4.4 Maintenance

4.4-1 Test the CPR Communicator for the correct signals by monitoring the specific CPR module at the headend.

4.4-2 Simulate the "General Alarm" signal by removing the plug (or shorting jumper) on the front of the CPR module. Verify this alarm is received at the headend.

4.4-3 Check all wiring connections. Refer to Section 2.1.

The CPR Communicator Module should be tested and the connections checked on a regular basis. This should be performed at least once a year. Other than the two simple steps, described above, there is no routine maintenance required for the CPR Communicator module.

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4.5 Troubleshooting

Because it is impossible to account for every possible symptom and solution in a CATV Network, the following troubleshooting suggestions should be used as a general guideline. Refer to Figure 4.5-1

Table 4.5-1: Troubleshooting

External cabinet LED's not operating (one or both)	Bad or loose connection at the communication module	Check connections on the front and rear of the communication module and secure appropriately
	Defective communication module	Replace the communication module
	Defective LED or LED's	Replace the bad LED or LED's
Weak battery string LED's not operating	Bad or loose connections at the communication module	Check for proper connections at the communication module and tighten as necessary
	Bad or loose connections at the batteries	Check for proper connections at the batteries and tighten
Remote reported levels are not accurate	Bad or loose connections	Check and tighten all connections
	Defective communication module	Replace communication module
	Software conflicts	Take readings on-site with a true-RMS meter and compare
Not receiving any information at the Head-End, NOC or etc...	Defective transponder	Replace transponder
	Bad or loose connection between the transponder and the communication module (Level Two)	Check and tighten all connections
	Bad or loose connection between the communication module and the CPR power supply	Check and tighten all connections
	Tx and Rx Frequencies of the Communicator Module and the Headend controller do not match	Replace Communicator Module With one that has the same Tx and Rx Frequencies as the Rest of the system.
	Interference in forward or reverse path caused by ingress, sheath currents, poor grounding, etc.	Verify communicator module works by connecting to its RS-232 port. Investigate signal paths and noise levels.

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